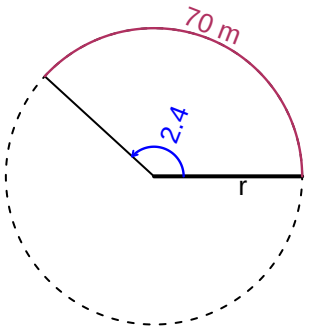
Name: Date:

Trig Final (SLTN v648)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 2.4 radians. The arc length is 70 meters. How long is the radius in meters?

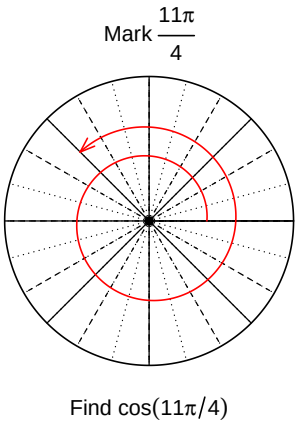


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

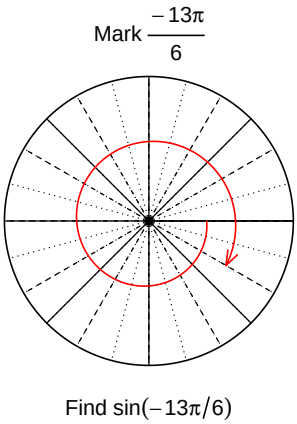
$r = 29.17$ meters.

Question 2

Consider angles $\frac{11\pi}{4}$ and $\frac{-13\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{11\pi}{4}\right)$ and $\sin\left(\frac{-13\pi}{6}\right)$ by using a unit circle (provided separately).



Find $\cos(11\pi/4)$



Find $\sin(-13\pi/6)$

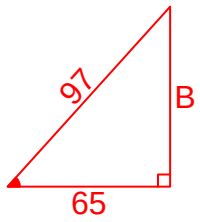
$\cos(11\pi/4) = \frac{-\sqrt{2}}{2}$

$\sin(-13\pi/6) = \frac{-1}{2}$

Question 3

If $\cos(\theta) = \frac{65}{97}$, and θ is in quadrant IV, determine an exact value for $\tan(\theta)$.

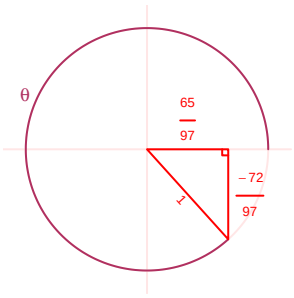
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$65^2 + B^2 = 97^2$$
$$B = \sqrt{97^2 - 65^2}$$
$$B = 72$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\tan(\theta) = \frac{\frac{-72}{97}}{\frac{65}{97}} = \frac{-72}{65}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = -6.25$ meters, an amplitude of 3.69 meters, and a frequency of 7.33 Hz. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -3.69\cos(2\pi 7.33t) - 6.25$$

or

$$y = -3.69\cos(14.66\pi t) - 6.25$$

or

$$y = -3.69\cos(46.06t) - 6.25$$